193-219-SE1-005

EOSDIS Core System Project

Interface Requirements Document Between EOSDIS Core System (ECS) and Science Computing Facilities

August 1993

Hughes Applied Information Systems, Inc.
Landover, Maryland

Interface Requirements Document Between EOSDIS Core System (ECS) and Science Computing Facilities

August 1993

Prepared Under Contract NAS5-60000
CDRL Item 39

SUBMITTED BY

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Preface

This document is a formal contract deliverable with an approval code 1. It requires Government review and approval prior to acceptance and use. Changes to this document also require Government approval prior to acceptance and use. Changes to this document shall be made by document change notice (DCN) or by complete revision.

This IRD defines the interface requirements between ECS and the SCF. Note that although this document is not release specific, emphasis has been placed on defining the interface requirements needed to support release 1.

Once approved, this document shall be under the ECS Project Configuration Control. Any questions or proposed changes should be addressed to:

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Abstract

The Earth Observing System Data and Information System (EOSDIS) Core System (ECS) is a ten year project involving the collection and distribution of data from space and ground based measurement systems to provide the scientific basis for understanding global change. Using ECS as their window to the system, the international science community is able to access data from a distributed archive in the United States sized at several thousand tera-bytes and from other international Earth Science support systems. In general, this effort is focused at determining and predicting global environmental status and trends. To accomplish this mission, it is necessary for ECS to interface to a wide variety of external systems. This document represents the requirements to provide an interface between ECS and the Science Computing Facilities (SCFs).

The SCFs are data processing resources (minicomputers, mainframes, workstations) located at NASA and external earth science research facilities. They are operated by NASA-funded earth science investigators. They support user access to ECS for the general research community of interdisciplinary scientists and instrument investigators. They will support algorithm development and maintenance, product quality control, special product development, product archiving, ancillary and correlative data provision and ingest, and other activities needed by the general earth science research community in performing research using ECS resources. The SCFs primarily interface with ECS elements in the Science Data Processing Segment (SDPS).

The ECS contractor team will use the process described in Methodology for Definition of External Interfaces (DID 208/SE1) to develop interface requirements. Memoranda of Understanding (MOUs), Inter-Project Agreements (IPAs), Project Implementation Plans (PIPs), Project Data Management Plans (PDMPs), and Level 2 and Level 3 Requirement Specifications are used in the methodology to evolve formal Interface Requirement Documents (IRDs). The Earth Science Data and Information System (ESDIS) Project has joint responsibility with other projects for development and maintenance of IRD sections that are relevant to the other projects.

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Abbreviations and Acronyms

1. Introduction

1.1 Identification

This Interface Requirement Document (IRD), Contract Data Requirement List (CDRL) item 039, whose requirements are specified in Data Item Description (DID) 219/SE1, is a required deliverable under the Earth Observing System Data and Information System (EOSDIS) Core System (ECS), Contract (NAS5-60000). It defines the interface requirements between ECS and Science Computing Facilities.

1.2 Scope

This IRD defines interfaces that exist between ECS and the Science Computing Facilities. This document focuses specifically on those requirements unique to ECS-SCF interaction, especially with regard to the passing of algorithms, calibration coefficients, quality assurance information and other data between the two systems in support of algorithm development, Standard Product quality assurance performed by scientists at an SCF, and Standard and special product generation.

SCFs provide data processing support to the following types of users: Instrument and interdisciplinary science Investigators (PI); Instrument and interdisciplinary science Co-Investigators (Co-I); Team Leaders (TL); and Team Members (TM); as well as those in several of these roles.

Interface requirements covering user interaction with ECS of a general nature are not covered in this document. User interfaces related to ECS communications can be found in the External Networks (NSI) IRD (August 1993). Interface details and requirements related to general user interaction with ECS can be found in the User Interface Requirements Report (CDRL-023) and the Science User's Guide & Operations Procedure Handbook (CDRL-025). Also, details on the scope and context of the PGS Toolkit portion of the Algorithm Development and Integration Toolkit can be found in the Draft ECS PGS Toolkit Requirements Specification (August 1993) and the ECS Operations Concept Document (CDRL-112).

The ESDIS Project has joint responsibility with Science Computing Facilities for the development and maintenance of IRD sections that are relevant to the Science Computing Facilities. Any changes in the interface requirements must be agreed upon by the relevant participating parties, and then assessed at the ESDIS Project Level. This IRD will be approved under the signature of the ESDIS Project Manager. The SCF Project Manager (TBR) will be responsible for approving the section or sections of the IRD that relate to the SCFs.

1.3 Purpose and Objectives

This document was written to formalize the interpretation and general understanding of those ECS interfaces that are unique to the Science Computing Facilities. For ECS, this document is

considered a roll-out of a set of requirements from the ECS Functional and Performance Requirements Specification (DID 216/SE1). It is meant to stand alone as a total document and contains more detail on external interfaces than is provided in a Level 3 requirements specification.

The objective of this document is to provide a focus for defining related Interface Control Documents (ICDs). These ICDs are jointly developed by ECS and the interfacing project in order to define the design of each interface specified in this IRD. It is anticipated that more than one ICD can be derived from a single IRD.

This document provides a point of mutual control of external interface definitions for the ESDIS Configuration Control Board (CCB) and the CCBs serving the Science Computing Facilities.

1.4 Status and Schedule

This version of the Interface Requirement Document (IRD) is submitted to the Government one month prior to the System Requirements Review (SRR) as a CCB approval code 1 (SE1) document. At the Government's option, this document may be designated to be under full Government CCB control. Changes may be submitted for consideration by Contractor and Government CCBs under the normal change process at any time.

1.5 Document Organization

This Interface Requirements Document is organized as described below

Section 1	Introduction - Introduces the IRDs scope, purpose, objectives, status, schedule, and document organization.
Section 2	Related Documentation - Provides a bibliography of reference documents for the IRD organized by parent, applicable, and information subsections.
Section 3	Systems Description - Provides an overview of both interfacing systems and a discussion of the architectural system components involved in the interface.
Section 4	Operational Context and Data Flow - Provides a discussion of how the interface is used from an operational point of view and provides an architectural context diagram highlighting the major data flows in the interface.
Section 5	Functional and Performance Interface Requirements - Requirements are extracted from supporting documentation and are sorted for presentation by ECS architectural components (system, segment and elements) with a further division denoting functional or performance type.
Section 6	Interface Control Documentation Plan - Identifies and summarizes the ICDs that will derive from this IRD.

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2. Related Documentation

2.1 Parent Documents

The following documents are the parents from which this document's scope and content derive:

GSFC 5/21/93	EOSDIS Core System Statement of Work
604/OP1 SRR	ECS Operations Concept Document
216/SE1 SRR	ECS Requirements Specification
201/SE1 5/93	Systems Engineering Plan for the ECS Project
208/SE1 SRR	Methodology for Definition of External Interfaces
301/DV1 5/93	ECS System Implementation Plan

2.2 Applicable Documents

The following documents are referenced herein and are directly applicable to this document. In the event of conflict between any of these documents and this document, this document shall take precedence.

209/SE1 SDR	External Interface Control Document Between EOSDIS Core System (ECS) and Science Computing Facilities
CDRL-023	User Interface Requirements
CDRL-025	Science User's Guide & Operations Procedure Handbook
CDRL-023	Interface Requirements Between ECS and External Networks (NSI)
	Draft PGS Toolkit Requirements Specification

2.3 Information Documents

The following documents, although not directly applicable, amplify or clarify the information presented in this document, but are not binding.

None.

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3. Systems Descriptions

The following section provides a summary description of the ECS and Science Computing Facility (SCF) systems. This section provides functional descriptions of each system, as well as architectural summaries.

Section 3 contains three subsections:

3.1 Systems Relationship Overview

3.2 ECS System Description

3.3 SCF System Description

3.1 Systems Relationship Overview

ECS and SCF must work together to provide users with computing resources for algorithm development, and Standard and special product generation. Specifically, this entails support for algorithm integration and test, product quality assurance, calibration coefficient development and product generation.

Sections 3.2 and 3.3 provide overall views of ECS and a typical SCF in order to form a basis for understanding the interface requirements between the two systems. Although the exact resource configurations may differ among the various SCFs, a standard set of interface requirements exists for all SCFs interfacing with the ECS.

3.2 EOSDIS Core System (ECS)

3.2.1 ECS Overview

The Earth Observing System (EOS) Data and Information System (EOSDIS) as the National Aeronautics and Space Administration's (NASA) overall Earth Science discipline data system will provide the ground system for the collection and analysis of science data to support scientists in resolving the dynamics of the Earth's components and the processes by which they interact. As a part of the Earth Observing System (EOS) Program, EOSDIS will support the planning, scheduling, and control of the EOS series of spacecraft; exchanging commands, data, and algorithms with the European Space Agency (ESA), Japan, Canada, the National Oceanic and Atmospheric Administration (NOAA), and any other non-NASA entities involved in the overall EOS mission; the coordination of these activities with other data gathering systems; and the transformation of the observations into physical variables, providing for higher levels of processing and presenting the data to users in forms that facilitate and stimulate interactive scientific research. EOSDIS will support NASA Earth Probe (i.e., non-EOS NASA Earth science flight projects) missions and will add to its data base other selected non-EOS data that are required for use in conjunction with EOS data. EOS, Earth Probe, and other selected non-

EOS data and products will be cataloged, archived, and be retrievable in a manner that supports the scientist in developing a better understanding of the way the earth functions.

The EOSDIS Core System (ECS) is based on the functional and performance capabilities required by the baseline EOSDIS design, i.e., the acquisition, processing, storage, and distribution of the data acquired by the EOS spacecraft; the incorporation of selected non-EOS data sets, specifically data sets produced by sources other than EOS instruments that complement data from EOS instruments in supporting NASA's Earth science research program; and the development of a comprehensive data and information management system.

In addition to fully supporting EOS series, the ECS will provide information management and data archive and distribution functions for all other NASA Earth science flight missions, NASA instruments flown on non-NASA flight missions, and for all other NASA held Earth science data. This will include:

a. Existing data held by NASA to be migrated from EOSDIS Version 0, implemented outside the scope of the ECS contract. This data will include data from past and then current NASA Earth science flight missions and other Earth science data held by NASA to support its overall Earth science research program.

b. Data from NASA Earth science flight missions, collectively known as "Earth Probes," that will deliver data to the ECS after their information management and data archive and distribution functions become operational. This will include missions on-going as ECS is implemented, as well as new missions, such as the Tropical Rainfall Measuring Mission (TRMM), that begin after the ECS is implemented.

c. Data from NASA instruments flown on non-NASA spacecraft.

3.2.2 ECS Components

ECS is comprised of three segments defined to support three major operational areas: flight operations, science data processing, and communications/system management. The segments are further divided into ECS functional elements. The ECS segments and their supporting elements are described below:

a. A Flight Operations Segment (FOS) which manages and controls the EOS spacecraft and instruments. The FOS elements include:

   1. EOS Operations Center (EOC) – GSFC element responsible for mission planning and scheduling and the control and monitoring of mission operations of the EOS spacecraft and instruments.

   2. Instrument Control Centers (ICCs) – the elements responsible for scheduling, commanding, and operating the science instruments and for monitoring of instrument performance. Several ICCs constitute an Instrument Control Facility (ICF).

   3. Instrument Support Terminals (ISTs) – investigator-site ECS software to connect a Principal Investigator (PI) or Team Leader (TL) to an ICC in support of remote instrument control and monitoring. (Investigator facilities are outside the FOS, but connected to it via the EOSDIS Science Network (ESN).)

b. A Science Data Processing Segment (SDPS) which provides a set of processing and distribution elements for science data and a data information system for the entire EOSDIS. The SDPS consists of:

   1. Product Generation System (PGS) – an element which processes data from the EOS instruments to Level 1-4 data products.

   2. Data Archive and Distribution System (DADS) – an element which provides short and long term storage for EOS, and other Earth Observing Missions, and other related data, software, and results, and distributes the data to EOSDIS users.

   3. Information Management System (IMS) – a distributed data and information management element and user services suite for the ECS including a catalog system in support of user data selection and ordering. The IMS will be implemented in a distributed configuration, with the distribution of IMS functions between the DAACs and an IMS coordinating element to be optimized to meet the requirements of the ECS specification. The IMS will function as a single integrated service from the point of view of the user, and will present the same comprehensive view of the ECS from any IMS access node.

c. A Communications and System Management Segment (CSMS) which provides overall ECS management and operations of the ground system resources, provides facilities and communications/networking services for an extensive science data communications network, and manages the interfaces to NASA's Space Network (SN) and Deep Space Network (DSN), the Wallops tracking station, the EOS Communications (Ecom), the Program Support Communications Network (PSCN), and other communications networks. SN, DSN, and Wallops tracking station are accessed by CSMS via the Ecom interfaces. The CSMS elements include:

   1. System Management Center (SMC) – a system management service for EOSDIS ground system resources.

   2. EOSDIS Science Network (ESN) – a dedicated internal ECS communications network and services providing, in combination with other institutional and public networks, for the interconnection of the widely distributed EOSDIS facilities, IPs, and EOS investigators at their ISTs or SCFs as required to support ECS operations; and a separate network interface from the ECS to gateways provided by the NASA Science Internet (NSI) to external science research networks in support of other science communities' access to the ECS.

3.3 Science Computing Facilities (SCFs)

Science Computing Facilities (SCFs) are user-operated computing systems that provide investigators with the local data processing resources necessary to exploit ECS and other EOSDIS resources. SCFs are used to develop and maintain standard and special product algorithms, produce special data products, perform quality assurance (QA), and analyze and synthesize EOS and other data.

ECS offers the science investigator extensive processing power and data archives. Consequently, the design of the SCF interface with the ECS is required to allow the investigator to:

- Process a standard product using the ECS production resources, and
- Access data products for the purpose of standard and special product development. These data products may reside at archival facilities internal to ECS, or at facilities external to, but accessible by, ECS.

The SCFs also interface with the ECS to support the operational science data processing. The SDPS interfaces with the SCFs to perform data quality assessment, to exchange special and standard products, and to receive updated algorithms and coordinate their test and integration into the production environment.

3.3.1 SCF Overview

The SCF is a data processing facility administered and provided by the user. ECS supplies the SCFs with not only the IMS and DADS tools supplied to general users, but also additional PGS and IMS Toolkit functions.

The ECS delivers a PGS Toolkit to the SCFs. The PGS Toolkit routines provide scientists with tools that they need to simulate the operation of their algorithms in the PGS production environment. The PGS Toolkit routines provide file access, job control, error logging, dynamic storage allocation, standard mathematical operations such as matrix inversion and fast Fourier transforms, as well as scientific routines that compose a science processing library. Interface requirements for the PGS Toolkit can be found in the Draft PGS Toolkit Requirements Specification. The Algorithm Integration and Test Service of the PGS is responsible for receiving new algorithms, algorithms updates, and calibration coefficients from scientists at the SCF and verifying that they operate properly in the product generation environment. Test products are produced and delivered to the SCF for review. The requirements for these interfaces are specified in this IRD.

Science users at SCFs will have the Virtual IMS portion of the IMS Toolkit available locally, in addition to the IMS Toolkit functions for visualization and user application services. The Virtual IMS, together with the PGS Toolkit, expedites the science algorithm integration process by providing the science investigators with tools for the development and management of metadata at their home facility. The Virtual IMS provides data management capabilities for a selected set of database management systems residing at the SCF. Using the Virtual IMS, the science user formats the product metadata generated by their PGS Toolkit and uploads it into their local database as metadata structures compatible with the ECS Information Management System

(IMS). The Virtual IMS provides the inventory metadata query, update, add, and delete capabilities to assist in the development of their science product software. The Virtual IMS also provides tools to facilitate the migration of special products to the ECS, thus enhancing access to earth science data for the science user community as a whole.

3.3.2 Physical Link to ECS

SCFs may communicate with ECS in one of three configurations:

- SCFs that are colocated with DAACs may be directly connected via Government Furnished Equipment (GFE) Metropolitan Area Networks (MANs) to the PGS, DADS, and IMS located in that DAAC, and by derivation to the rest of the ECS.
- Optionally, some SCFs connect through GFE dedicated Wide Area Network (WAN) circuits to a DAAC chosen for advantageous communications cost performance to the government.
- Other SCFs will connect to ECS through their existing NSI or other ECS external network connection.

3.3.3 Definition of the Interface

In addition to the physical communication connection, the interface between ECS and the SCF must be concretely defined. This will clarify the terms and statements made in defining the interface, and will facilitate the reader's understanding.

The point at which the SCF to ECS interface occurs is at the software interface between the IMS residing locally on an SCF's processor or system, and the processor' s or system's own non-ECS software. This is not to state that a particular routine exists to do this, but only to refer to the total set of code that comprises the software interfaces between these two items.

The IMS toolkit supplied to users includes communications software for connectivity with the ESN. An SCF's physical connectivity to the ESN is achieved via (1) an institution's Local Area Network (LAN), (2) an institution's router or bridge, and (3) a GFE MAN or WAN circuit. Note that the protocol stack running on the SCF must be either TCP/IP or GOSIP-2 (depending solely on the path used to access the ESN.) Figure 3-1 illustrates this interface at the SCF.

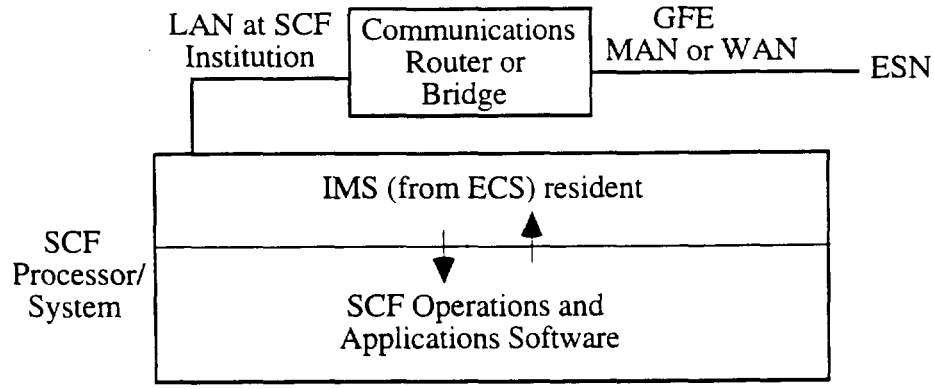

Figure 3-1. ECS-SCF Interface in SCF Applications Software

In addition to the IMS Toolkit functions for visualization and user application service supplied to all users, the IMS Toolkits furnished to the SCFs include additional Virtual IMS information management software. The Virtual IMS provides data base management capabilities at a local SCF to support the ingest and management of special product metadata prior to their submission to the ECS.

The PGS Toolkit serves to insulate science algorithms from the PGS architecture and also to provide a development system which accurately simulates the algorithms' operational environment at the DAAC.

Data and other information is transferred between the SCF and ECS via the ESN. Specifically, the SCF transmits the following to ECS: L1 to L4 Special Products, metadata, ancillary data, calibration data, correlative data, QA results, documents and algorithms. In turn, ECS transmits the following to the SCF: L0 to L4 Standard Products, algorithm test results, metadata, ancillary data, calibration data, correlative data, QA requests, documents and algorithms.

4. Operational Context and Data Flow

4.1 Operational Scenarios

The PGS supports the integration of new and updated science algorithms into the production environment through an interactive link to the scientists located at the SCFs. The SCFs transmit new or revised algorithms and calibration coefficients, along with associated documentation and test data, to the PGS. The SCFs will be able to perform this transfer of information electronically. The PGS Algorithm Integration and Test staff is responsible for ensuring that the science software supplied by the SCF is successfully integrated and tested in the PGS environment. In the PGS, a dedicated test/backup string separates algorithm test and integration and prototype product generation from operational processing and reprocessing. Test products generated by the PGS using candidate algorithms are sent to the SCF. SCF reviews of the test products are sent to the PGS. As part of the algorithm life-cycle, some algorithms may be run for a time in the PGS in a mode where routine generation is not guaranteed, producing prototype products which are treated in all other respects by the SDPS as standard products.

The science algorithms developed at the SCFs are created using the PGS Toolkit which is provided to the SCFs by the ECS. The PGS Toolkit serves to insulate science algorithms from the PGS architecture and to provide a development system which simulates the algorithms' operational environment at the DAAC. The PGS Toolkit routines provide file access, job control, error logging, dynamic storage allocation, standard mathematical operations such as matrix inversion and fast Fourier transforms, as well as scientific routines comprising a science processing library. The toolkit helps ensure code portability as the algorithm is ported from development hardware, through the DAAC system, and through potential hardware changes as the ECS matures.

The PGS performs product QA as part of product generation. This consists of automatically running a quality assurance executable (QAE), if provided by the scientists, against the product data. That QAE performs QA in the PGS and updates the corresponding metadata with a quality assurance code. Following automatic QA, manual quality assurance may be performed by the PGS if required. If manual or automatic PGS QA identifies a problem, the PGS alerts the appropriate SCF.

If SCF QA is required after PGS QA, the SCF is informed that the product file and its accompanying metadata are ready for QA. The scientists perform QA at their SCF within an established time frame, and send QA information back to the ECS when completed. ECS updates the product metadata with the QA information from the SCF. ECS then archives the product data and its accompanying metadata, making them available to the science community at large. If completion of the QA at the SCF is delayed beyond the time frame allotted, ECS automatically marks the product metadata to reflect that the product has not been QA'd by the scientist, and proceeds to archive and make available the data and its metadata. ECS will update this metadata when the final QA information arrives from the SCF. The PGS can also ensure

that the products are not stored in the DADS if the SCF QA indicates that the products are of inferior quality and should not be placed in DADS archives.

The SCF-ECS interface concerns not only operational support of standard products, but also the development of special products at the SCFs. Special products are those products considered part of a research investigation, but which may be limited to a specific region or time period, are not accepted as standard products, and are not generated at the PGS. The Virtual IMS portion of the IMS Toolkit supplies science investigators with tools for the local development and management of metadata. The Virtual IMS greatly enhances the scientists' ability to use the SCFs to develop and test algorithms and coefficients used in the generation of special products. A scientist at an SCF uses the Virtual IMS to format product metadata generated by the software created using the PGS Toolkit. Independent of the operational ECS architecture, the Virtual IMS provides the scientist with metadata query, update, add and delete capabilities. Upon completing test and development at their SCF, a scientist may send special product algorithms, coefficients and results via the ESN to the ECS.

4.2 Data Flow

Figure 4-1 illustrates the interfaces between ECS and the SCFs.

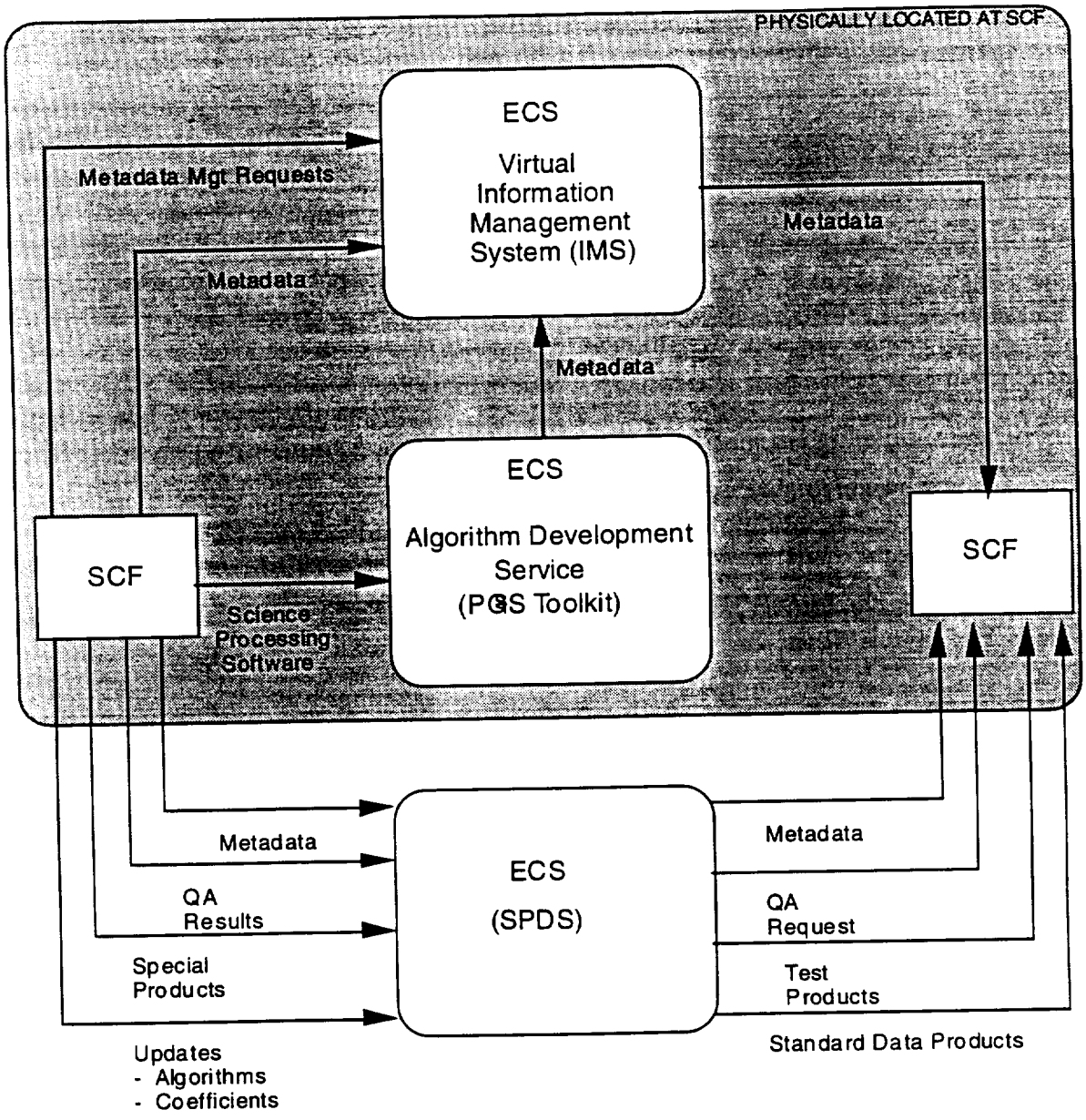

Figure 4-1. SCF to ECS Architecture Context Diagram

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5. Functional and Performance Interface Requirements

5.1 ECS System Wide Requirements

5.1.1 Functional Interface Requirements

EOSDX-9010 ECS elements shall receive data including the following types of supporting information from the SCFs:

a. Algorithms

b. Software fixes

c. Instrument calibration data

d. Integration support requests

e. Metadata for Special Products archiving

f. Data transfer requests (inventories, directories, and browse)

g. Data Quality/Instrument assessment

h. Instrument operations information

i. Ancillary data

EOSDX-9020 The ECS elements shall send the following types of data at a minimum to the SCFs:

a. Software Problem Reports

b. Documentation

c. Metadata (copies of inventories)

d. Browse data

e. Archived data

5.1.2 Performance Interface Requirements

TBD.

5.2. Science Data Processing Segment (SDPS) Requirements

5.2.1 Functional Interface Requirements

SDPSX-9010 The SDPS shall interface with the PIs and the other science users at the SCFs to support the development and testing of data product algorithms and QA of produced data products.

SPDSX-9020 The SDPS shall receive a quality report that is generated and transmitted by the PIs or the other science users at an SCF, and appended to the data products being archived by the SDPS.

5.2.2 Performance Interface Requirements

TBD.

5.2.3 Product Generation System (PGS) Requirements

5.2.3.1 Functional Interface Requirements

PGSX-9010 The PGS shall have the capability to accept POSIX-compliant science algorithms from scientists at the SCFs and compile algorithm source code written in the following standard programming languages:

a. C

b. FORTRAN

c. Ada

PGSX-9020 The PGS shall process pre-launch test data and provide test data product samples, test algorithm software, metadata and other data to the SCFs for user verification.

PGSX-9030 The PGS shall accept from the SCFs new or modified calibration coefficients to be validated in the test environment. Calibration coefficients shall contain the following information at a minimum:

a. Identification of coefficient data set

b. Calibration coefficients values

c. Author and version number

d. Identification of related processing algorithm

e. Start and stop date/time of applicability

f. Date and time

g. SCF identification

h. Reasons for update

PGSX-9040 The PGS shall accept from the SCF new or modified Standard Product algorithms to be tested at the processing facility. This software shall be received into the test environment and shall contain the following information at a minimum:

a. Algorithm identification

b. Algorithm source code

c. List of required inputs

d. Processing dependencies

e. Test data and procedures

f. Algorithm documentation

PGSX-9050 The PGS shall have the capability to schedule and coordinate algorithm and calibration coefficient test time in the test environment with the appropriate SCF.

PGSX-9060 The PGS shall have the capability to send test products to the SCF for analysis. These shall contain the results of algorithm testing and shall contain the following information at a minimum:

a. Algorithm identification

b. Test time(s)

c. Processor identification

d. Test results

PGSX-9070 The PGS shall have the capability to validate, through testing, that SCF processing algorithms will execute properly in the operational environment. Validation shall include final compilation and linkage of the source code and testing to verify proper software execution in the operational environment based on indicated data and test results provided by the SCF and the investigator, but shall not include scientific validation of products.

PGSX-9080 The PGS shall provide a toolkit to the SCF containing tools for use in simulating the operation of algorithms in the PGS production environment. The requirements for the PGS toolkit are further specified in the Draft PGS Toolkit Requirements Specification. The toolkit shall contain the following information at a minimum:

a. File access subroutines

b. Job control routines

c. Error logging subroutines

d. Mass storage allocation subroutines

e. Ancillary data access subroutines for use with ephemeris data, Earth rotation data, and time and position measurement data

f. Mathematical libraries for linear algebra and analysis, and statistical calculations

g. Science processing library containing graphics routines, as well as routines for image processing, data visualization

PGSX-9090 The PGS shall have the capability to execute QA algorithms provided by the scientists at the SCFs.

PGSX-9100 The PGS shall receive product QA from the SCF which shall describe the results of the scientist's product quality review at an SCF. Product QA shall contain the following information at a minimum:

a. Identification of product

b. QA results

c. Product storage and processing instructions

PGSX-9110 The PGS shall have the capability to accept from the SCFs the identification of products that are not to be stored in the DADS due to inferior quality or other reasons. The reason for all such actions shall also be specified.

5.2.3.2 Performance Interface Requirements

TBD.

5.2.4 Data Archive and Distribution System (DADS) Requirements

5.2.4.1 Functional Interface Requirements

DADSX-9010 Each DADS shall receive from the SCF, at a minimum, the following:

a. Special products (L1-L4)

b. Metadata

c. Ancillary data

d. Calibration data

e. Correlative data

f. Documents

g. Algorithms

DADSX-9020 Each DADS shall be capable of ingesting data to support the instrument science team(s) at SCFs in:

a. Pre-launch checkout of their instruments

b. Pre-launch science checkout

c. Development of initial calibration information.

DADSX-9030 Each DADS shall be capable of providing access to data to support the instrument science team(s) at SCFs in:

a. Pre-launch checkout of their instruments

b. Pre-launch science checkout

c. Development of initial calibration information.

DADSX-9040 Each DADS shall send to the SCF, at a minimum, the following:

a. L0-L4 data
b. Special products (L1-L4)
c. Metadata
d. Ancillary data
e. Calibration data
f. Correlative data
g. Documents
h. Algorithms

5.2.4.2 Performance Interface Requirements

TBD.

5.2.5 Information Management System (IMS) Requirements

5.2.5.1 Functional Interface Requirements

IMSX-9000 The Virtual IMS Information Management software shall operate with a local data base using an ECS supported DBMS provided by the SCF, thereby facilitating the process of importation of the local data base into the ECS.

IMSX-9010 The Virtual IMS Information Management software shall provide the SCF with metadata management services for local SCF metadata.

IMSX-9020 The Virtual IMS Information Management software shall provide the SCF with capabilities to search the local SCF data base.

IMSX-9030 The Virtual IMS Information Management software shall provide the SCF with local interactive and batch data management capabilities to:

a. Add
b. Update
c. Delete
d. Retrieve

IMSX-9040 The Virtual IMS Information Management software shall provide local SCF data base administration utilities for, at a minimum:

a. Modifying the data base schema

b. Performance monitoring

c. Administration of user access control

d. Data base backup

e. Data base recovery

IMSX-9050 The Virtual IMS Information Management tools shall provide the SCF with the capability to modify the data base structure while adhering to established standards.

IMSX-9060 The Virtual IMS Information Management software shall provide the SCF with the capability to electronically load data base structures and their content.

IMSX-9070 The Virtual IMS Information Management software data base management system shall provide the SCF with, at a minimum, the capability to select data for retrieval by:

a. Boolean operators

b. Relational operators

c. Attribute values

d. Combinations thereof

IMSX-9080 The Virtual IMS Information Management software shall allow a user to locate and identify desired data without having detailed knowledge of the SCF system's:

a. Architecture

b. Data base management system

c. Data base structure

d. Query languages

e. Data formats

5.2.5.2 Performance Interface Requirements

TBD.

5.3 Interface Standards

ECS has a number of similar interfaces with multiple external systems. For example, ECS exchanges metadata with ADCs, ODCs, Landsat-7 and TRMM. Standardizing common interfaces such as these will reduce system cost and complexity, and increase system flexibility and growth.

EXTNX0010 The interfaces specified in this IRD shall conform to the ECS defined external interface standards.

6. Interface Control Documentation Plan

External ICDs define the functional and physical design of each interface between ECS and an external system as identified in the IRDs. There is at least one corresponding ICD for each IRD, and traceability is maintained between the interfaces described in the two sets of documents. An ICD includes the precise data contents and format of each interface. All modes (options) of data exchange for each interface are described as well as the conditions required for each mode or option. Additionally, data rates, duty cycles, error conditions, and error handling procedures are included. The sequence of exchanges is completely described (e.g., required handshaking.) Communications protocols or physical media are detailed for each interface. External ICDs are prepared per DID 209/SE1 and provide the basis for unambiguous interface development. Each ICD is controlled by ESDIS Configuration Control.

The ICD planned which corresponds to this IRD is entitled Interface Control Document Between EOSDIS Core System (ECS) and Science Computing Facilities.

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Abbreviations and Acronyms

CCB	Configuration Control Board
CDRL	Contract Data Requirements List
Co-I	Co-Investigators
CSMS	Communications and System Management Segment
DAAC	Distributed Active Archive Center
DADS	Data Archive and Distribution System
DBMS	Data Base Management System
DID	Data Item Description
DCN	Document Change Notice
DSN	Deep Space Network
Ecom	EOS Communications
ECS	EOSDIS Core System
EOC	EOS Operations Center
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ESA	European Space Agency
ESDIS	Earth Science Data and Information System
ESN	EOSDIS Science Network
FOS	Flight Operations Segment
F&PRS	Functional and Performance Requirements Specification
FST	Field Support Terminal
GFE	Government Furnished Equipment
GSFC	Goddard Space Flight Center
HAIS	Hughes Applied Information Systems
ICC	Instrument Control Center
ICD	Interface Control Document
ICF	Instrument Control Facility
ICWG	Interface Control Working Group

IMS	Information Management System
IP	International Partners
IPA	Inter-Project Agreement
IRD	Interface Requirements Document
IST	Instrument Support Terminal
LAN	Local Area Network
MAN	Metropolitan Area Network
MOU	Memoranda of Understanding
NASA	National Aeronautical and Space Administration
NASCOM	NASA Communications
NOAA	National Oceanic and Atmospheric Administration
NSI	NASA Science Internet
ODC	Other Data Center
PSCN	Program Support Communications Network
PDMP	Project Data Management Plan
PGS	Product Generation System
PI	Principal Investigator
PIP	Project Implementation Plan
QA	Quality Assurance
QAE	Quality Assurance Executable
SCF	Science Computing Facility
SDPS	Science Data Processing Segment
SMC	System Management Center
SN	Space Network
SRR	System Requirements Review
TL	Team Leader
TM	Team Members
TRMM	Tropical Rainfall Measuring Mission
WAN	Wide Area Network